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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/501,351	07/14/2004	Seiji Samukawa	SHIG CPTA0502FE	7535
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HAYES, SOLOWAY P.C. 3450 E. SUNRISE DRIVE, SUITE 140 TUCSON, AZ 85718				
			EXAMINER DHINGRA, RAKESH KUMAR	
			ART UNIT 1763	PAPER NUMBER

DATE MAILED: 09/22/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/501,351

Applicant(s)

SAMUKAWA ET AL.

Examiner

Rakesh K. Dhingra

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 14 July 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-3 and 5-12 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3, 5-12 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 July 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 07/04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Information Disclosure Statement***

1. The information disclosure statement filed 01/03/05 fails to comply with the provisions of 37 CFR 1.97, 1.98 and MPEP § 609 because the list of patents/publications has not been submitted on a separate paper. Although the patents/publications cited in the IPER are already included in IDS dated 7/14/04 and have been considered in that IDS, the IDS dated 01/03/05 could not be considered since the list of patents was not submitted on a separate paper. It has been placed in the application file, but the information referred to therein has not been formally considered as to the merits. Applicant is advised that the date of any re-submission of any item of information contained in this information disclosure statement or the submission of any missing element(s) will be the date of submission for purposes of determining compliance with the requirements based on the time of filing the statement, including all certification requirements for statements under 37 CFR 1.97(e). See MPEP § 609.05(a).

### ***Drawings***

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description:

Figures 14a, 14b – reference number 616 (cover) is not shown in the drawing (as mentioned on page 17, line 15 in the specification).

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant

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will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 112***

3. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites in part "wherein said sensor sections have pattern portions, and a plurality of electrodes for separating ions and electrons of plasma by energy and include electrodes having the same potential as that of said silicon substrate directly under said pattern portions" where "include electrodes having the same potential" is indefinite since as per Figure 8, only electrode 422 is connected to silicon substrate 411 (that is at the same potential). Thus for the purpose of examination on merits this limitation is interpreted to be "include electrode having the same potential". Applicant is invited to clarify/amend the claim appropriately.

***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

5. Claims 1, 2, 5 and 9 are rejected under 35 U.S.C. 102(a) as being anticipated by Roche et al (US PG PUB No. 2004/0007326).

Regarding Claims 1: Roche et al teach an on-wafer plasma monitoring apparatus 14 (Figures 1-8) comprising:

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one or a plurality of sensor sections 42, power source unit 56 that takes power from plasma through sensors 52, and a wireless transceiver (I/O unit) 36 that inputs/outputs signals from/to outside, which are provided on a probe (silicon wafer) 14.

Roche et al also teach that said sensor sections could be patterned directly into surface of silicon wafer 14 and that several probes (electrodes) 48 could be fabricated on the surface of probe wafer 14. Roche et al also teach that the measured V-I trend is practically same whether RF bias is applied or not (that is, voltage of electrodes is same as that of semiconductor wafer) [paragraphs 0010, 0026-0052].

Regarding Claim 2: Roche et al teach probes (electrodes) 48 are made from aluminum made by sputter deposition over a silicon wafer having an insulating oxide layer (between electrodes) 140. Roche et al do not teach that the insulating oxide layer is aluminum oxide, however it is known in the art to use anodization, that is, aluminum oxide ( $\gamma\text{-Al}_2\text{O}_3$ ) as insulating layer over silicon wafers (paragraph 0046).

Regarding Claims 5, 9: Roche et al teach that transceiver 36 can be an infrared (light) sensors 72 as a means of wireless communication with outside the chamber. Further, Roche et al also teach that apparatus can also use photo-diode detection devices also for light emission diagnostics (paragraphs 0037, 0048).

### ***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was

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commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

**7. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Roche et al (US PG PUB No. 2004/0007326) in view of Johnson et al (US PG PUB No. 2004/0021094).**

Regarding Claim 3: Roche et al teach all limitations of the claim except that side surface of aluminum electrode is covered with a thin oxide film.

Johnson et al teach an apparatus (Figures 2-5) that includes a monitoring wafer 12 with a substrate 20 that has aluminum ion current collectors (electrodes) 26 that have an anodized (covered with thin oxide film) cylindrical surface (paragraphs 0039, 0040).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use use aluminum electrodes with side surface covered with oxide film as taught by Johnson et al in the apparatus of Roche et al to insulate the electrode from the adjoining structures (like wall of enclosing wafer 10 or adjoining electrodes).

**8. Claims 6, 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Roche et al (US PG PUB No. 2004/0007326) in view of Loewenhardt et al (US Patent No. 5,451,784).**

Regarding Claim 6: Roche et al teach all limitations of the claim including a bottom electrode 176 that collects ion current flux (Figure 9).

Roche et al do not explicitly teach ion energy analyzer with collector electrode at the bottom of the sensor section.

Loewenhardt et al teach an apparatus (Figures 1, 2) that includes a monitoring wafer 102 with ion energy analyzers 104 and where a collector electrode 200 is disposed at the bottom of the

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sensor section that measures ion current and enables to obtain ion energy distribution (column 3, line 30 to column 6, line 15).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use collector electrode at the bottom of the sensor as taught by Loewenhardt et al in the apparatus of Roche et al to obtain accurate ion energy profile.

Regarding Claim 12: Loewenhardt et al teach probes 106 that can measure ion current (Figure 2 and column 6, lines 1-15).

**9. Claims 7, 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Roche et al (US PG PUB No. 2004/0007326) in view of Toyoda (US Patent No. 6,462,328).**

Regarding Claim 7: Roche et al teach all limitations of the claim including use of photon detectors as sensors, but do not teach photo detector detects light made incident into a pattern by photo-induced current generated in an insulating film.

Toyoda teaches an apparatus (Figure 5) that includes photosensors Dr, Dc that detect light after passing through silicon oxide (insulating film) 40, 38, 25 and where the electric current is proportional to the amount of incident light (column 5, lines 38-58).

It would have been obvious to one of ordinary skill in the art at the time of the invention to manufacture photo-detection sensor as taught by Toyoda in the apparatus of Roche et al to obtain accurate an accurate measurement of light energy.

Regarding Claim 8: Toyoda teaches that photo sensor includes an aluminum film (metal film) 42a formed on the oxide film 40 that helps to avoid scattering light reaching the light receiving sensor portions. Further, the dependence of light detected on the work function difference is a functional aspect that would depend upon the type of materials selected for the metallic and the oxide coatings and other related parameters.

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**10. Claims 10, 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Roche et al (US PG PUB No. 2004/0007326) in view of Pinnaduwege (US patent No. 5,896,196)**

Regarding Claims 10,11: Roche et al teach all limitations of the claim including use of spectrophotometer sensors, that incorporate specific bandwidth optical filters using chip fabrication techniques for measuring plasma parameters like ion current flux, charge particle (like ions) density etc.

Roche et al do not explicitly teach use of spectrophotometric sensors for identification of radicals and ions by collision between ions/radicals and electrons generated by an electron gun. Pinnaduwege teaches an apparatus (Figures 1-3) where a glow discharge apparatus 10 has an analysis region 22 in which an electron beam is introduced from electrode 14 (electron gun) and positive and negative ions can be identified using optical spectrometer 54. Pinnaduwege also teaches that typically in prior art an electron gun is used as a source of electrons that collide with gas particles (column 1, line 10 to column 32, line 30).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use ion radical identification techniques as taught by Pinnaduwege in the apparatus of Roche et al to enable accurately identify ions and radicals using emission spectrophotometric techniques.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

**Ohmi (US patent No. 5,444,259)** teach an apparatus (Figure 1) where type and density of ions and radicals can be evaluated by adding a spectral analyzer to the plasma processing apparatus (column 6, lines 50-60).



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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



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